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Redescription of an Australian cladoceran, *Alona archeri* Sars, 1888 (Branchiopoda: Anomopoda: Chydoridae)

Переописание австралийского ветвистоусого рака *Alona archeri* Sars, 1888 (Branchiopoda: Anomopoda: Chydoridae)

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КЛЮЧЕВЫЕ СЛОВА: *Alona archeri*, ветвистоусые раки, систематика, морфология, распространение.

ABSTRACT: The Australian cladoceran *Alona archeri* Sars, 1888 is redescribed from G. O. Sars' type material. *A. archeri* seems to be a "typical" *Alona* species, related to species of the *pulchella*-group (*A. pulchella* King, 1853, *A. cambouei* Guerne & Richard, 1893 and *A. glabra* Sars, 1901) and to *A. bromelicola* Smirnov, 1989. Detailed morphology of *A. archeri* is provided for the first time.

РЕЗЮМЕ: Австралийский ветвистоусый рак *Alona archeri* Sars, 1888 был переописан с типового материала Г. О. Сарса. *A. archeri* является типичным видом рода *Alona*, родственным видам группы *pulchella* (*A. pulchella* King, 1853,*A. cambouei* Guerne & Richard, 1893 and *A. glabra* Sars, 1901) и виду *A. bromelicola* Smirnov, 1989. Впервые детально исследована морфология *A. archeri*.

Introduction

The Australian cladocerans *Alona archeri* Sars, 1888 was described by G. O. Sars among other cladoceras, raised from dried mud from water bodies in the vicinity of Rockhampton, Queensland. The description was accompanied by high-quality drawings of ephippial female and adult male and their postabdomens [Sars, 1988: 59–62, PI. 6, figs. 1–4].

After the initial description, there were only a few reports of *A. archeri*. It was reported from Indonesia [Brehm, 1933] and from Tadzhikistan [Mukhamediev, 1986]. Smirnov & Timms [1983] reported *A. archeri* from Queensland, New South Wales and Tasmania as a rare species. All authors did not study detailed morphology of this species, and Korovchinsky [1996] did not list *A. archeri* among adequately described species.

One sample and one slide with specimens of *A. archeri* were present among Sars' collection of Cladocera deposited in Zoological Museum of Oslo University. The aim of this study was to investigate detailed morphology of *A. archeri*, and to determine validity of this species and its place within the genus.

Material and Methods

The studied material includes one G.O. Sars' original sample and one slide of *A. archeri* from Australia. Animals were selected from the sample under a binocular stereoscopic microscope, placed on slides (in a drop of a glycerol-ethanol mixture) and studied under the optical microscope. Two adult parthenogentic females, adult male, and juvenile male of instar II were dissected for the analysis of appendages. All specimens were measured using an eyepiece-micrometer. Drawings were made with a camera lucida.

ABBREVIATIONS

In the list of material: ZMOU — Zoological Museum of Oslo University.

In illustrations and text: I–V — thoracic limbs I–V; as — accessory seta of limb I; e1–3 — endites 1–3 of limb I; ep — epipodite; ex — exopodite; IDL — inner distal lobe of limb I; IP — interpore distance (distance between anterior and posterior major head pores); ODL — outer distal lobe of limb I; PP — postpore distance (distance between posterior head pore and posterior corner of head shield); s — sensillum.

Results

Only one sample containing specimens of *A. archeri* was present in Sars' collection, it was labelled by Sars as following: **"Australia, udkl. af torret Müdder"** (it means "raised from dried mud"), and the only slide of *A. archeri* was labelled similarly: **"udkl. af Austr. müdder"**. Samples containing species of cla-

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docera described in the same work [Sars, 1888], including several species he never mentioned in any following articles (like *A. clathrata* Sars, 1888), were also labelled in the same way, without any precise locations. The samples of Australian Cladocera species described later were labelled differently, with more precise location, and their labels had never included words like "**udkl. af torret Müdder**". Taking in consideration the fact that Sars has never mentioned *A. archeri* in any following works, we can conclude with great deal of certainity that he dealt with this species only once. Thus this sample of *A. archeri* was taken from the aquarium where he had grown this species — so it could be treated as the type sample.

In the description of *A. archeri*, Sars [1888] mentioned the lateral fascicles of the postabdomen reduced to a single setule as an important diagnostic character of the species. But detailed investigation revealed that in fact lateral fascicles of the postabdomen of this species consist of several setules, as in any other species of the genus. The distalmost setule of each fascicle is strong and easily noticeable even at the low magnification, but proximal setules are very thin and short and visible only at high magnification of a high-quality microscope. Unfortunately, Sars' mistake has not been revealed till now, and this false character has been used as a diagnostic by the following authors [Smirnov, 1971, Smirnov& Timms, 1983].

This led to recent description of *A. archeri* from Queensland as a new species, *A. beverleyae* Smirnov, 1989. This taxon was described from the single parthenogenetic female, and only its outer morphology was described. But the size, general shape, number of major head pores, and armament of postabdomen with characteristic denticles and lateral fascicles of setules leave no doubt that *A. beverleyae* is a synonym of *A. archeri*.

Alona archeri Sars, 1888
Figs 1–30.

Syn. *A. beverleyae* Smirnov, 1989

Sars, 1888: 59–62, PI. 6, figs. 1–4; Smirnov, 1971: 389–390, fig. 466; Smirnov & Timms, 1983: 48, fig. 43; Smirnov, 1989: 139, fig. 1 (*beverleyae*).

TYPE LOCALITY: Australia, Queensland, neighbourhood of Rockhampton, Water Hole at Cattle Station.

Lectotype: parthenogentic female, preserved in ethanol, ZMOU, sample F18326a

Paralectotypes: over 50 parthenogenetic females, several ephippial females and males, several juvenile males of instar II, many damaged specimens preserved in ethanol — ZMOU, sample F18326; 15 parthenogentic females, 5 ephippial females, 6 males in best state of preservation, taken from the original sample, ZMOU, sample F18326b; 2 dissected parthenogentic females on slides ZMOU, F18326c–d; dissected adult male and dissected juvenile male of instar II on slides ZMOU, F18326e–f.

Other material: 7 parthenogenetic females from the same location on slide, ZMOU, slide F9637.

DIAGNOSIS

Female: Body of moderate height, regular oval, maximum height at the middle of body. Length ca. 1.4–1.6 times maximum height. 40–50 setae at ventral margin differentiated in size. Postero-ventral corner without denticles. Valves without reticulation, sometimes covered by tubercules.

Head shield elongated, with almost straight posterior margin, rostrum short and rounded. Eye two times larger than ocellus. Three major head pores of equal size with very narrow connection between them, central pore at the middle. PP less than 0.5 IP. Lateral head pores located in small depressions about 1 IP distance from midline, at level of anterior major head pore. Labrum of moderate size, labral keel narrow, rounded, with a rounded apex, without any clusters of setules on posterior margin of keel.

Postabdomen relatively narrow, with parallel margins, length about 2.9–3.1 height. Basis of claws separated from distal margin by clear incision. Distal margin straight, distal angle almost right-angled. Dorsal margin with distal part about 1.5 times longer than preanal one, postanal and anal portions equal. Preanal angle well expressed, postanal angle weakly defined. Preanal margin straight.

Postabomen with 3–5 well-developed, sharp, slender marginal denticles on the distal part of postanal margin and 6–7 groups of marginal setules on the proximal part of postanal margin and anal margin. 8–10 very narrow lateral fascicles of setules, of moderate length, posteriormost setae of each fascicle longest, slightly shorter than longest marginal denticles. Postabdominal claw of moderate length, a little longer than preanal portion of postabdomen. Basal spine about than 0.2 of the claw length.

Antennule of moderate size, with nine short aesthetascs. All aesthetascs projecting beyond anterior margin of the head shield. Antennal formula, setae 0-0-3/1-1-3, spines 1-0-1/0-0-1. Seta arising from basal segment of endopod thin, projecting beyond tip of distal segment. Spine on basal segment of exopod of less than two-third of middle segment length. Spines on apical segments slightly shorter than apical segments.

IDL of trunk limb I with three setae, first of these short, thin, others long, well-developed. Exopodite of trunk limb III with seven setae greatly different in length, 5th being longest. Exopodite IV with six setae. Exopodite V with four setae. Epipodites III–V without any projections. Limb V without gnathobase filter plate. Trunk limb VI absent.

Length: 0.38–0.48 mm.

Male: body oval, length about 2 times maximum height. Ventral and dorsal margin weakly concave, almost straight, posterior margin strongly concave, both posteroventral and posterodorsal angles broadly rounded. Eye small, round, ocellus of irregular shape, twice the size of the eye.

Postabdomen short, with almost parallel margins in distal part, with length about 3 times height. Ventral margin almost straight, with clear step in region of gonopores, which open ventrally near basis of claws. Distal margin almost right-angled, dorso-distal angle prominent, almost right. Dorsal margin straight, with distal part two times longer than preanal one. Preanal angle well expressed, postanal angle absent. Postabdominal claws shorter than preanal portion of postabdomen, basal spine about 0.25 of claw length.

Length: 0.38–0.48 mm.

DIFFERENTIAL DIAGNOSIS

Narrow postabdomen with parallel margins separates *A. archeri* from the majority of the genus. It differs from species of *pulchella*-group (*A. pulchella* King, 1853, *A. cambouei* Guerne & Richard, 1893 and *A. glabra* Sars, 1901) by armament of postabdomen. In these species the length of postanal denticles decreases more or less gradually, and they evenly pass into the grouped marginal setules on anal margin. In *A. archeri*, well-developed denticles are located only on the distal angle of postabdomen, and are proximally replaced by short setules. Also, species of *pulchella*-group have wide

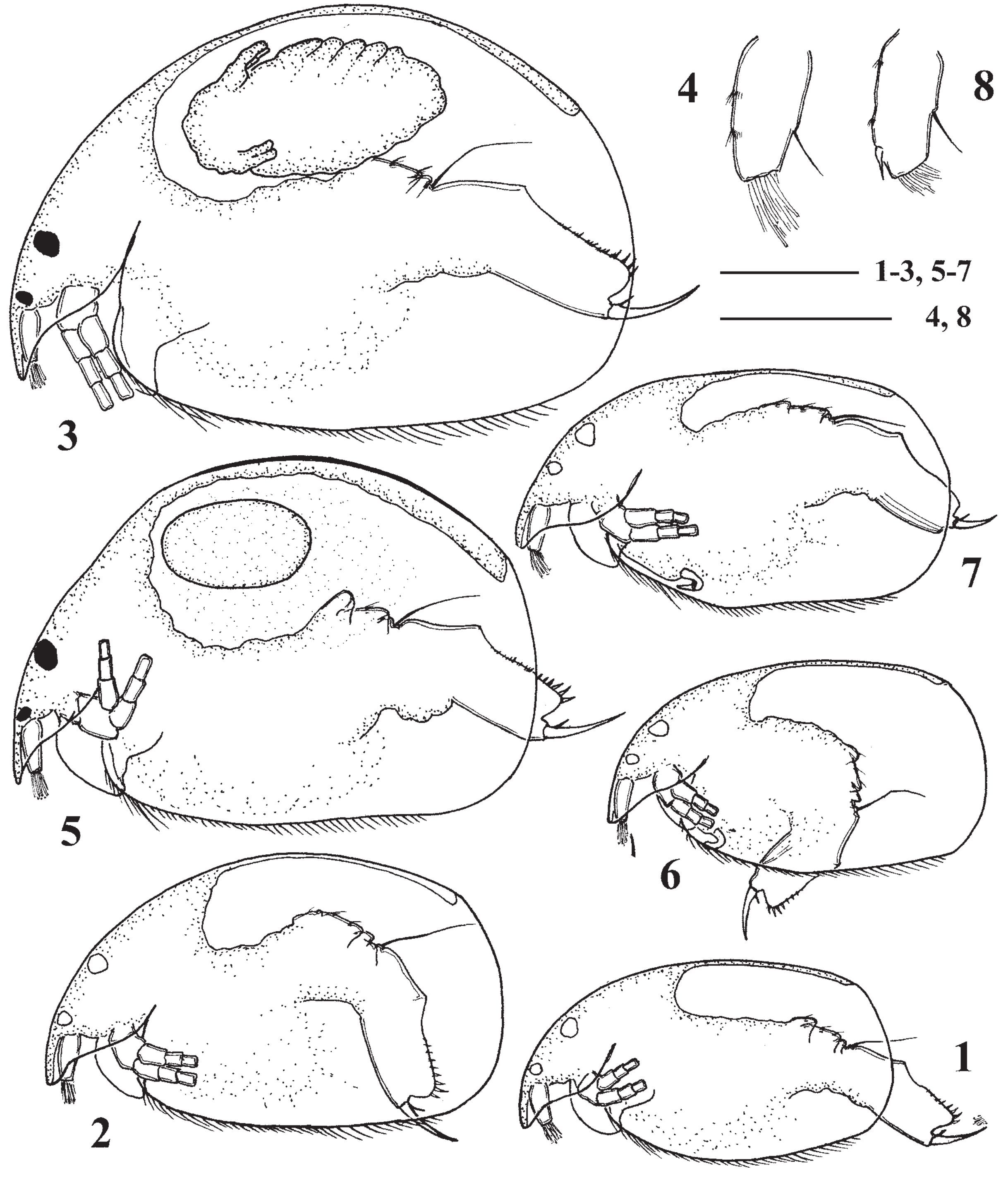


Fig. 1–8. *Alona archeri* Sars, 1888 from Australia, Queensland, neighbourhood of Rockhampton: 1–2 — juvenile females of instars I and II, lateral viev; 3–4 — parthenogenetic female, lateral view and antennule; 5 — ephippial female, lateral view; 6 — juvenile male of instar II, lateral view; 7–8 — adult male, lateral view and antennule. Scale bars denote 0.1 mm for 1–3, 5–7, and 0.05 mm for 4, 8.

Рис. 1–8. *Alona archeri* Sars, 1888 из Австралии, штат Квинсленд, окрестности Рокхемптона: 1–2 — ювенильные самки первого и второго возраста; 3–4 — партеногенетическая самка и ее антеннула; 5 — эфиппиальная самка; 6 — ювенильная самка второго возраста; 7–8 — взрослый самец и его антеннула. Масштаб 0,1 мм для 1–3, 5–7, и 0,05 мм для 4, 8.

lateral fascicles of setules, with very narrow gaps between them, while in *A. archeri* fascicles are narrow and gaps are wide. Normally developed basal spine of postabdominal claw easily separates *A. archeri* from *A. karelica*.

DESCRIPTION

General: In lateral view, body irregular oval, low in juvenile female of instar I and II (Fig. 1–2), regular oval, high in adults (Fig. 3), moderately compressed laterally. Maximum height at the middle of body. In adults length about 1.4 – 1.6 times maximum height. Dorsal margin strongly and evenly curved, depression between head and rest of body absent. Postero-dorsal and postero-ventral angles broadly rounded. Posterior margin convex. About 80 very short setules of equal length at posterio-dorsal angle, these setules not organized into groups (Fig. 9). A row of about hundred setules along posterior margin very close to it on inner side of carapace, these setules not organized into groups. Ventral margin weakly convex to straight, with 40–50 setae. Antero-ventral angle rounded. Carapace without any reticulation, sometimes covered by tubercules, similar to that present in other species of genus.

Head relatively small, triangle-round in lateral view. In lateral view rostrum protruding downwards. Ocellus small, eye large, two times larger than ocellus. Distance from tip of rostrum to ocellus subequal to that between ocellus and eye.

Head shield of usual shape for the genus, with maximum width behind mandibular articulation. Rostrum short and rounded. Posterior margin almost straight. Three major head pores with a very narrow connection between them (Fig. 11–12). Central pore equal to anterior and posterior one, located in the middle. PP less than 0.5 IP. Lateral head pores located in small depressions about 1 IP distance from midline, at level anterior major head pore.

Labrum of moderate size (Fig. 13–14). Distal labral plate without setulation. Labral keel of moderate width, with a recurved rounded apex. Anterior margin of keel convex, posterior margin with clear notch in the middle, without clusters of setules. No distinct lateral projections on labrum and no folds surrounding its base.

Thorax and a*bdomen* more elongated than in most other species of *Alona*, thorax longer than abdomen. Dorsal surface of abdominal segments not saddle-shaped. No abdominal projections.

Postabdomen relatively narrow, with parallel margins, length about 2.9–3.1 height. Basis of claws separated from distal margin by clear incision. Distal margin straight, distal angle almost right. Dorsal margin with distal part about 1.5 times longer than preanal one, postanal and anal portions equal. Preanal angle well expressed, postanal angle weakly defined. Preanal margin straight.

Postabomen with 3–5 well-developed, sharp, slender marginal denticles on the distal part of postanal margin and 6–7 groups of marginal setules on the proximal part of postanal margin and anal margin. 8–10 narrow lateral fascicles of setules, of moderate length, posteriormost setae of each fascicle longest, little shorter than longest marginal denticles. Postabdominal claw of moderate length, a little longer than preanal portion of postabdomen. Basal spine about 0.2 of the claw length.

Antennule of moderate size, not reaching the tip of rostrum, with 2 transverse rows of very short setules at anterior face (Fig. 4). Antennular seta thin, of about 1/3 of antennule length, arising at 2/3 distance from the base. Nine aestetascs, subequal in length, longest of about 1/2 length of antennule. All estetascs projecting beyond anterior margin of the head shield.

Antenna relatively short (Fig. 16). Antennal formula, setae 0-0-3/1-1-3, spines 1-0-1/0-0-1. Basal segment robust, with short seta between branches, branches relatively elongated, all segments cylindrical, with short setules around distal margin. Basal segments of branches 1.5 times longer than proximal segments. Seta arising from basal segment of endopod thin, longer than endopod. Seta arising from middle segment of endopod of similar size with apical setae. Spine on basal segment of exopod of less than two-third of middle segment length. Spines on apical segments slightly shorter than apical segments.

Trunk limb I of moderate size (Fig. 19–20). Epipodite oval, with short finger-like projection. Accessory seta short, thin, weakly setulated. ODL with one long seta, IDL with three setae, 1st IDL seta thin, pointed, short (about 1/4 of 3rd), 2nd and 3rd IDL setae 2-segmented, subequal in length, both with unilateral setules in distal part.

Endite 3 with four distally setulated setae, ventralmost seta shorter than others, subequal in length. On endite 2 there are three setulated in distal part setae, middle of them equal in length to ODL seta. Endite 1 with two distally setulated 2-segmented setae. No naked setae on anterior face of limb visible under the optical microscope. Six rows of thin long setules on ventral face of limb. Two ejector hooks, one little longer than other.

Trunk limb II triangle-round (Fig. 21). Exopodite elongated, with one very short, naked seta (Fig. 22). Inner portion of limb (“endopodite”) with eight scraping spines increasing progressively in length distally, with short setules in distal part. A portion of gnathobase bordering with “endopodite” with short setules. Distal armature of gnathobase with four elements. Filter plate II with seven setae, the posteriormost member considerably shorter, with dense cluster of long setules near its base.

Trunk limb III: epipodite oval, without any finger-like projection. Exopodite widening distally (Fig. 23), with seven setae, subdivided into distal and basal groups. 5th (from endopodite) distal setae longest, length of 2nd and 4th setae equal to 3/4 and 2/3 of 5th seta length, all other seta more than two times shorter than 5th. 1st seta naked, 2nd with short, thin setules in distal part, other setae feathered. Distal endite with 3 setae, two distalmost members slender, sharp, without visible setules in distal part; basalmost seta flattened, bilaterally armed with long setules. Basal endite with 4 setae. I was unable to study gnathobase and soft setae in detail. Filter plate III with seven setae.

Trunk limb IV: Pre-epipodite ovoid, setulated; epipodite oval, without finger-like process. Exopodite subquadrangular, with six setae (Fig. 24). 4th (from endopodite) seta being longest, 2nd, 5th, and 6th setae longer than half of 4th seta, 1st and 3rd setae three times shorter than 4th. All setae feathered, setules on lateral (5th and 6th) setae much longer than on lateral ones. Inner portion of limb IV with four setae (Fig. 25). Distalmost seta naked, stout, 3 others flattened, subequal in size, with narrow bases, each armed with 8–12 short thin setules. 3 soft setae increasing in size basally. Gnathobase with a long 2-segmented seta and a small hillock distally. Filter plate with five setae.

Trunk limb V (Fig. 26): pre-epipodite setulated. Epipodite oval, without finger-like process. Exopodite suboval, not subdivided into two lobes, lateral group with 3 long, densely setulated setae, distally only a single short seta. Inner limb portion as suboval lobe, with setulated inner margin. At inner face, two densely setulated setae, distalmost three times longer than other. No filter plate was found.

Trunk limb VI absent.

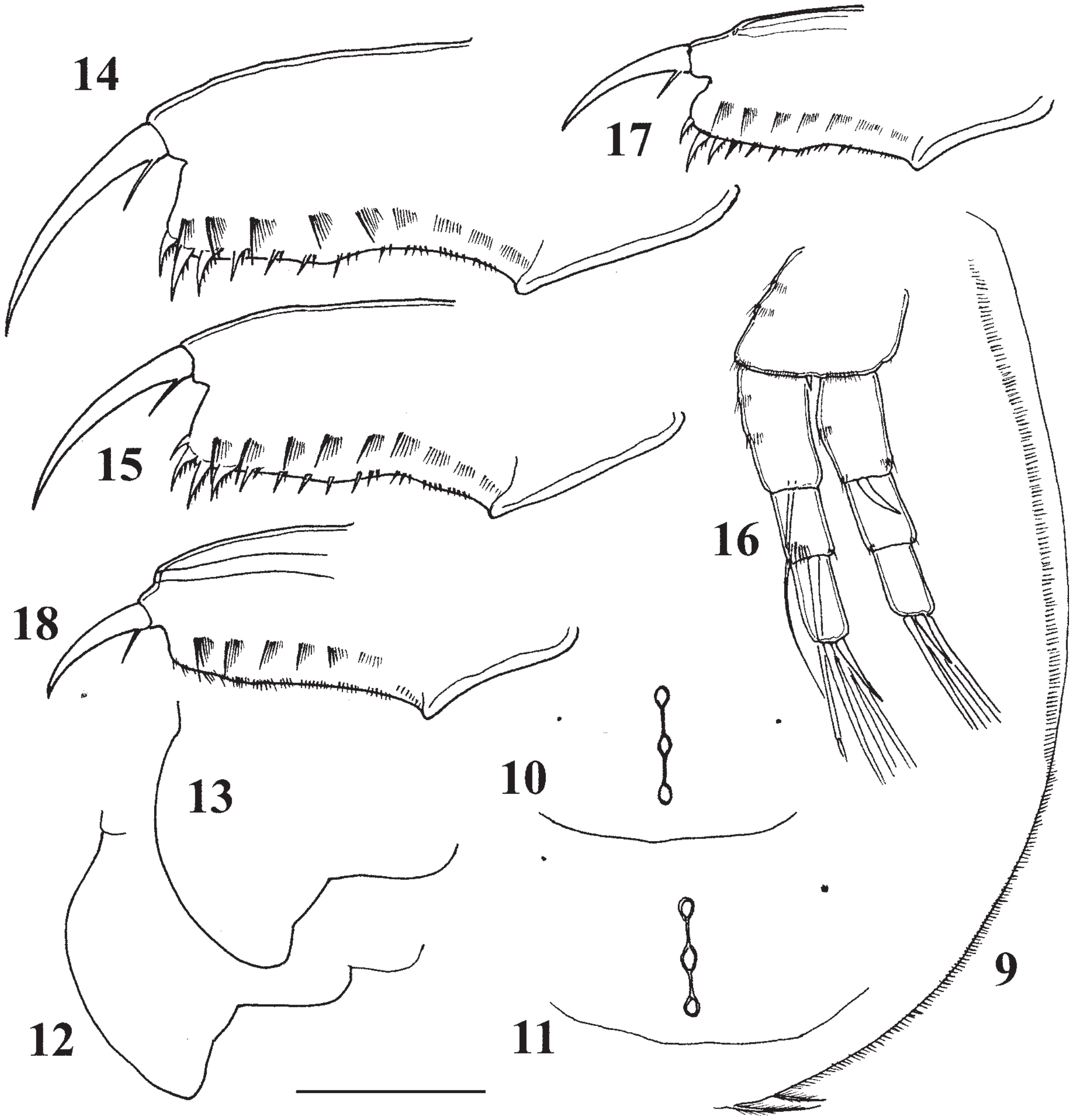


Fig. 9–18. *Alona archeri* Sars, 1888 from Australia, Queensland, neighbourhood of Rockhampton: 9–16 — parthenogenetic female: 9 — posterior margin and posteroventral angle of valves; 10–11 — head pores; 12–13 — labrum; 14–15 — postabdomen, 16 — antenna; 17–18 — postabdomens of juvenile male of instar II and adult male. Scale bar denotes 0.05 mm.

Рис. 9–18. *Alona archeri* Sars, 1888 из Австралии, штат Квинсленд, окрестности Рокхэмптона: 9–16 — партеногенетическая самка: 9 — задний край и задне-нижний угол створки; 10–11 — головные поры; 12–13 — лябрум; 14–15 — постабдомен, 16 — антенна; 17–18 — постабдомены ювенильного самца второго возраста и взрослого самца. Масштаб 0,05 мм.

Ephippial female with proportions similar to that of parthenogenetic female, dorsal margin high, irregulary convex (Fig. 5). Ephippium yellow-brown in the middle, without prominent sculpture, sometimes covered with tubercules.

Male: In juvenile male of instar II body low, irregular oval (Fig. 7), similar to that of juvenile female of instar I. In adult male, body more regular oval, length about 2 times maximum height (Fig. 8). Ventral and dorsal margin weakly concave, almost straight, posterior margin strongly concave, both posteroventral and posterodorsal angles broadly rounded. Eye small, round, ocellus of irregular shape, twice the size of the eye.

Postabdomen of juvenile male of instar II similar to that of female (Fig. 17), ventral margin with clear step in region of gonopores, which open ventrally at one-third distance from the basis of claws. Marginal denticles same as in female. In adult male, postabdomen shorter then in female, with almost parallel margins in distal part, with length about 3 times height (Fig. 18). Ventral margin almost straight, with clear step in region of gonopores, which open ventrally near

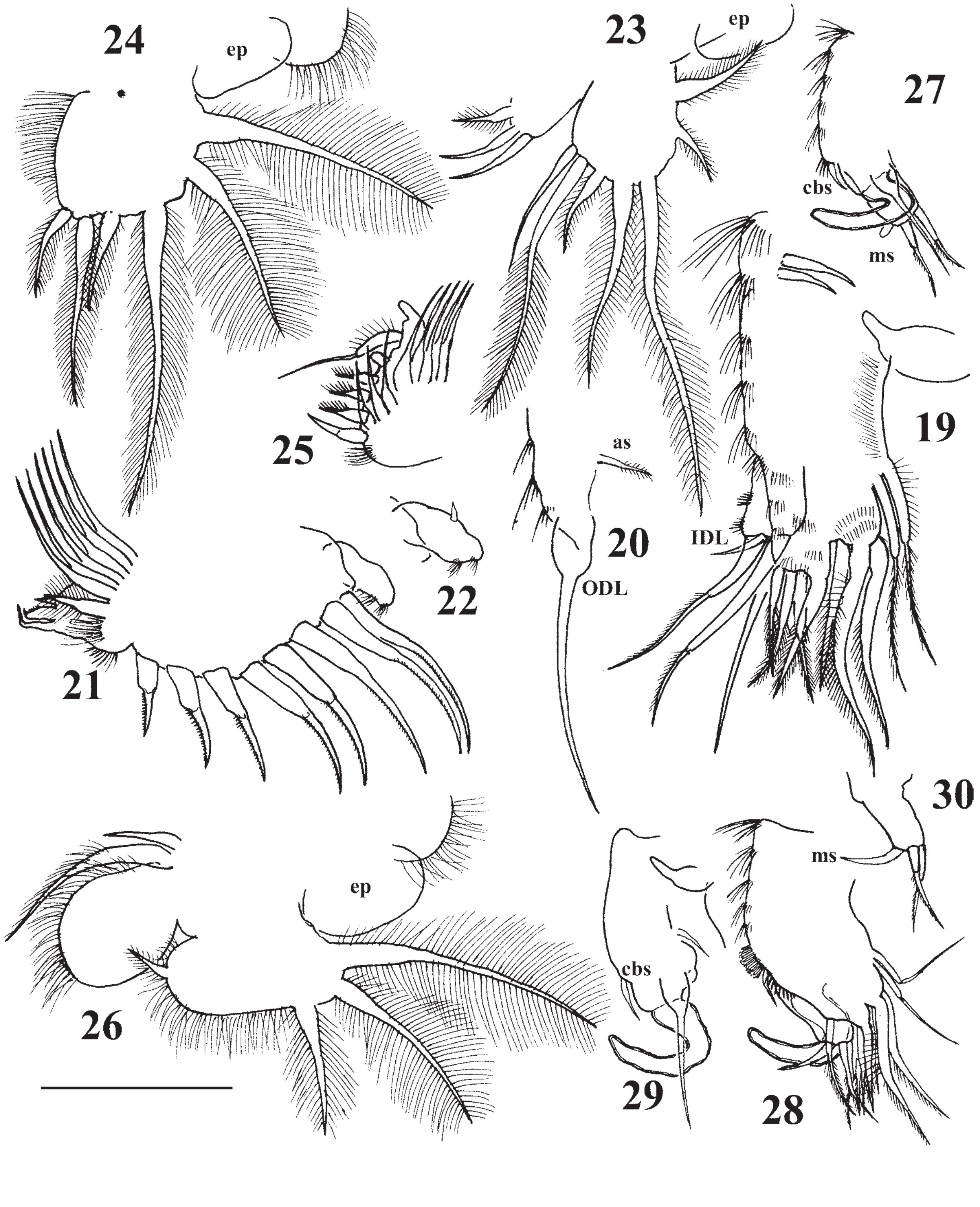


Fig. 19–30. *Alona archeri* Sars, 1888 from Australia, Queensland, neighbourhood of Rockhampton: 19–26 — parthenogenetic female: 19–20 — limb I and its ODL; 21–22 — limb II and its exopodite; 23 — limb III, 24–25 — exopodite and inner portion of limb IV; 26 — limb V; 27 — limb I of juvenile male of instar II; 28–30 — limb I, its copulatory hook and IDL of adult male. Scale bar denotes 0.05 mm.

Рис. 19–30. *Alona archeri* Sars, 1888 из Австралии, штат Квинсленд, окрестности Рокхэмптона: 19–26 — партеногенетическая самка: 19–20 — нога I и ее внешняя дистальная доля снаружи, 21–22 — нога II и ее экзоподит, 23 — нога III, 24–25 — экзоподит и внутренняя часть ноги IV, 26 — нога V; 27 — нога I ювенильного самца второго возраста; 28–30 — нога I взрослого самца, ее копулятивный крюк и внутренняя дистальная доля. Масштаб 0,05 мм.

basis of claws. Distal margin almost straight, dorso-distal angle prominent, almost right. Dorsal margin straight, with distal part two times longer than preanal one. Preanal angle well expressed, postanal angle absent. Postabdominal claws shorter than preanal portion of postabdomen, basal spine about 0.25 of claw length.

Antennule of adult male of same size as in female, male setae arising about 1/5–1/6 length from tip, short, acute (Fig. 8). It was impossible to determine the number of aesthetascs die to their poor preservation.

Trunk limb I : in juvenile male of instar II copulatory hook short, cutrved, with free arm a 3 times longer than base, anlage of copulatory brush seta present (Fig. 27). IDL with anlage of male seta, first of IDL setae absent. In adult male copulatory hook relatively short, U-shaped, with free arm a little longer than base, copulatory brush present (Fig. 28–29). Row of about 10 short, hard setules on ventral face of limb under copulatory brush. First of IDL setae absent, male seta curved, long, subequal to IDL setae (Fig. 30). Copulatory brush setae one and half times shorter than male seta.

SIZE: In juvenile females of instar I, length ranging from 0.23 to 0.25 mm, height from 0.14 to 0.15 mm, in females of instar II, length ranging from 0.29 to 0.33 mm, height from 0.18 to 0.2 mm. In adult female, length ranging from 0.38 to 0.48 mm, height from 0.22 to 0.34 mm. In juvenile males of instar II, length ranging from 0.24 to 0.26 mm. height from 0.13 to 0.14 mm. Length of adult male ranging from 0.27 to 0.3 mm, height from 0.15 to 0.17 mm.

DISTRIBUTION: South-East Australia (New South Wales, Queensland) and Tasmania. The fact that *A. archeri* has never been found in northern Australia [Smirnov & Timms, 1983] suggests that reports of finding of *A. archeri* outside Australia (in Indonesia and Central Asia) are doubtful, and should be rechecked.

Discussion

At present it is impossible to determine the exact distribution of *A. archeri*. The authors reporting this species from the other part of the word [Brehm, 1933; Mukhamediev, 1986] did not study head pores or limb morphology in their material, so their reports should be rechecked.

A. archeri apparently is closely related to the recently revised species of the *pulchella*-group (Australian *A. pulchella*, Palaeothropic *A. cambouei* and South American *A. glabra*) [Sinev 2001, 2002]. All these species have the same shape of postabdomen, narrow, with parallel margins and prominent distal angle. They have the same size (maximum length of female about 0.5 mm), posses 3 major head pores, and have similar morphology of antennula, antenna, and trunk limbs. Morphology of the first trunk limb in *A. archeri* and species of the *pulchella*-group is practically the same, there are no significant differences in the number, proportions or setulation of all setae [see Sinev, 2001, 2002]. The same is true of morphology of exopodite II, exopodite IV and whole limb V, also all these species lack limb VI. The shape of male postabdomen in *A. archeri* is similar to that of A. *cambouei* [see Dumont et al., 1984, listed as *A. pulchella* in this work] and *A. glabra* [see Sinev, 2002], (male of *A. pulchella* is unknown [Sinev, 2001]).

The differences between species of the *pulchella*-group and *A. archeri* are not numerous. The most apparent difference lies in the armament of female postabdomen. In the species of *pulchella*-group length of postanal denticles decreases anteriory more or less gradually, and they evenly pass into the grouped marginal setules on anal margin. In *A. archeri*, well-developed denticles are located only on the distal angle part of postabdomen, and are proximally replaced by short setules. Also, species of *pulchella*-group posses wide lateral fascicles of setules, consisting of more than ten setules each (sometimes with the exception of one-three distalmost fascicles, which could be more narrow). The gaps between fascicles are narrow, not exceeding one-third of width of surrounding fascicles. In *A. archeri* these fascicles are very narrow, with average number of setules in fascicle 5–8. The gaps between fascicles in postanal region are wide, their width varies from two-third to one width of the surrounding fascicles. Such differences in the morphology of lateral fascicles of setules are also present in morphology of male postabdomens of discussed species.

There are only two significant differences in trunk limb morphology between species of *pulchella*-group and *A. archeri* — proportions of setae of exopodite III and morphology of setae of the inner portion of limb IV. In *pulchella*-group, the 2nd from endopodite seta of exopodite III is at least two times shorter than the 5th seta (the longest), and all other setae are even shorter. In contrast, in *A. archeri* the 2nd seta is only a little shorter than the 5th seta, and the 4th seta exceeds a half of the 5th seta length. In *pulchella*-group, the 2nd seta possesses long, hard setules in proximal part, and the 4th setae is geniculated. In *A. archeri,* setules in distal part of the 2nd seta are shorter and hair-like, similar to setules of other exopodite III setae, and the 4th seta is not geniculated. (Fig. 27).

Distalmost seta of the inner portion of limb IV is of the same morphology in both *A. archeri* and species of *pulchella*-group. Three other setae (so-called “flaming-torch setae”) in *pulchella*-group are short, with reduced distal part, and armed with only 5–8 thick setules on distal margin. In *A. archeri,* these setae are long, with well-developed distal part, and armed with 8–12 short thin setules in distal part. Morphology of soft setae, gnathobase and filter plate IV does not differ significantly between discussed species.

Also, the posterior margin of labral keel in species of the *pulchella*-group is convex, without notch, while in *A. archeri* it is irregular, with a clear notch in the middle. But, because the morphology of labral keel is extremely variable in many species of *Alona*, and only one population of *A. archeri* has been studied, labral keel notched posteriorly may be present only in some population of *A. archeri*.

The central American bromeliad-inhabiting species *A. bromelicola,* also related to the species of the *pulchella*-group [Sinev, 2003], seems to be a more distant relative of *A. archeri*. All characters, shared by *A. bromelicola* and species of *pulchella*-group [see

Sinev, 2003], are also shared by *A. archeri*. In addition, *A. archeri* and *A. bromelicola* have the same, rare for the genus, morphology of marginal denticles of postabdomen — well-developed denticles are located only on the distal angle part of postabdomen, and are proximally replaced by short setules. *A. archeri* also seems to be in some degree related to *A. karelika* Stenroos, 1897, as all mentioned above species [see Sinev, 2001, 2003].

The form reported from Malaysia [Idris & Fernando, 1981; Idris,1983] under the name *A.* cf. *karelika* can be another species related to *A. archeri*. Unlike *A. karelika* s. str., this form has normally developed basal spine of the postabdominal claws and strongly convex distal margin and broadly rounded distal angle of postabdomen (the latter characters also separate it from *A. archeri*). It is similar to *A. archeri* by the general shape, size, shape of postabdomen (narrow, with parallel margins) and narrow lateral fascicles of setules of postabdomen with wide gaps between them. Unfortunately, like in the case of *A. karelika* s. str, detailed morphology, including trunk limbs, of Malaysian form has never been studied, and it is impossible to determine its exact taxonomic status and level of relationship with *A. archeri* and other species of genus.

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